This thesis is divided into three parts. In the first part we study mixed norm estimates for Riesz transforms associated with various differential operators. First we prove the mixed norm estimates for the Riesz transforms associated with Dunkl harmonic oscillator by means of vector valued inequalities for sequences of operators defined in terms of Laguerre function expansions. In certain cases, the result can be deduced from the corresponding result for Hermite Riesz transforms, for which we give a simple and an independent proof. The mixed norm estimates for Riesz transforms associated with other operators, namely the sub-Laplacian on Heisenberg group, special Hermite operator on $\mathbb{C}^d$ and Laplace-Beltrami operator on the group $SU(2)$ are obtained using their L^p estimates and by making use of a lemma of Herz and Riviere along with an idea of Rubio de Francia. Applying these results to functions expanded in terms of spherical harmonics, we deduce certain vector valued inequalities for sequences of operators defined in terms of radial parts of the corresponding operators.

In the second part, we study the chaotic behavior of the heat semigroup generated by the Dunkl-Laplacian Δ_κ on weighted L^P-spaces. In the general case, for the chaotic behavior of the Dunkl-heat semigroup on weighted L^p-spaces, we only have partial results, but in the case of the heat semigroup generated by the standard Laplacian, a complete picture of the chaotic behavior is obtained on the spaces $L^p\left(\mathbb{R}^d, \left(\varphi_{i\rho}(x)\right)^2 dx\right)$ where $\varphi_{i\rho}$ the Euclidean spherical function is. The behavior is very similar to the case of the Laplace-Beltrami operator on non-compact Riemannian symmetric spaces studied by Pramanik and Sarkar.

In the last part, we study mixed norm estimates for the Cesáro means associated with Dunkl-Hermite expansions on $\mathbb{R}^d$. These expansions arise when one considers the Dunkl-Hermite operator (or Dunkl harmonic oscillator) $H_\kappa := -\Delta_\kappa + |x|^2$. It is shown that the desired mixed norm estimates are equivalent to vector-valued inequalities for a sequence of Cesáro means for Laguerre expansions with shifted parameter. In order to obtain the latter, we develop an argument to extend these operators for complex values of the parameters involved and apply a version of Three Lines Lemma.